Advancing GIS map maintenance: change detection and update using ResU-Net: a case study on Chandigarh and Hyderabad cities, India

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India's metropolitan cities have been growing rapidly for many years. To keep geographical information accurate and current, it is essential to update GIS maps. Traditionally, experts have analysed new data sources and made necessary adjustments to the maps manually. Such manual monitoring is a laborious test both economically and in terms of workforce. Geographical data are transformed into digital maps by GIS mapping, making it simple to spot patterns, trends and linkages. Extraction of humanmade objects, such as roads, water bodies and buildings, from remotely sensed imageries holds significance in various urban applications, including urban land-use and land-cover assessment, geographical database updates and change detection. Cartosat-3 data can provide detailed information about buildings and their changes over time. Additionally, GIS maps are manually updated by rasterizing vector data. The suggested system consists of ResNet and U-Net architecture as its core. The bi-temporal images are initially co-registered to completely align 2020 and 2022 satellite images with respect to the coordinates. Buildings are then segmented using U-Net with ResNet as the backbone, and the resultant segments are converted from raster to vector format. The suggested model has been tested and trained using the Chandigarh dataset, which resulted in an accuracy of 95%.

Keywords: Change detection, digital maps, geographical data, remote sensing, urban planning.

cularly satellite images (e.g. Cartosat-3 images have a resolution of 0.28 m), is now possible due to the rapid advancement of sensor technology. In the previous 20 years, numerous studies have been conducted to accurately extract aspects from these incredibly exact images, such as buildings, roads and water bodies. If the satellite imagery has been spatially corrected to ensure good alignment with other datasets, it can be merged with vector or raster data in a geographic information system (GIS)[3,4].

The very high resolution satellite (VHRS) images are raster images in the PNG, JPG and GeoTIFF formats[5]. The file format GeoTIFF has a three-letter extension (.tif). It is a specific kind of TIFF file that includes GeoTIFF tags as the spatial referencing data for geo-referenced raster imagery. Vector data are used to generate the GIS maps. Since vector data offer a more precise and accurate representation of the real-world characteristics and objects the maps intend to represent, they are crucial for updating GIS maps[6].

To enable accurate and insightful analysis when working with multiple satellite images obtained at various periods or from various sensors, it is crucial to co-register or align them spatially. The geometrical disparities between images are addressed via co-registration, allowing for efficient comparison, integration and analysis. Geometric distortions are corrected, spatial consistency is maintained, and satellite images are aligned to a common reference system through co-registration. It also enables accurate comparison, change detection, fusion and integration of multiple datasets for